Buffer solutions

**1.** An aqueous solution containing a mixture of HF and sodium fluoride, NaF, can act as a buffer solution.

Calculate the mass of NaF that must be added to 150 mL of 0.0500 mol L–1 HF to give a buffer solution

with a pH of 4.02. Assume there is no change in volume. *M*(NaF) = 42.0 g mol–1 p*K*a(HF) = 3.17

**2. (i)** The following two solutions are mixed to form a buffer solution: 20.0 mL of 1 mol L–1

CH3NH3Cl and 30.0 mL of 1 mol L–1 CH3NH2 Calculate the pH of the resultant buffer solution.

p*K*a (CH3NH3+) = 10.64

**(ii)** Explain the effect on the solution formed in (i) when a small amount of acid is added.

**3. a)** A mixture of aqueous solutions of NH3 and ammonium chloride, NH4Cl, can act as a buffer solution. Calculate the mass of NH4Cl required, when added to 250 mL of a 0.150 mol L–1 NH3 solution, to give a buffer solution with a pH of 8.60. Assume there is no change in volume.

*M* (NH4Cl) = 53.5 g mol–1 p*K*a (NH4+) = 9.24

**b)** Discuss the ability of the NH3 / NH4Cl solution to act as a buffer at a pH of 8.60. In you answer you should:

• describe the function of a buffer solution

• evaluate its effectiveness when small amounts of acid or base are added

• include any relevant equations.

**4)** A buffer solution is made by adding solid sodium methanoate, HCOONa, to an aqueous solution of methanoic acid, HCOOH. p*K*a(HCOOH) = 3.74

**a)** Describe the function of a buffer solution.

**b)** Explain why the solution made with methanoic acid, HCOOH, and sodium methanoate, HCOONa, has

the ability to act as a buffer. *Your answer should include relevant equations.*

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